ALLOY TARGET USED FOR PRODUCING FLAT PANEL DISPLAYS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an alloy target used for producing flat panel displays and, more particularly, to an alloy target used for producing thin film electrodes or conductive wires on the substrate of a flat panel display.

2. Description of Related Art

In recent years, flat panel displays have become the eminent display device in the market, in place of cathode ray tube displays. For flat panel displays, the anodes located on the substrate are usually formed from conductive materials, such as indium tin oxide (ITO) or AZO and cooperate with metal or alloy cathodes having low work function to serve as a control unit of illuminant pixels.

Chromium is a common material for producing wires in a flat panel display, due to its good conductivity, good corrosion resistance and low cost. However, the electrical resistance of chromium is much higher than copper or silver, so it cannot drive the illuminant layer to show the image at low voltage. The image control of a flat panel display using chromium wires therefore cannot be optimized. On the other hand, in high electrical resistance, the temperature of a flat panel display using chromium wires usually rises excessively during operation, resulting in high electricity consumption and low power efficiency. The increasing temperature will

further affect the emission and the conduction efficiency between thin film anode and illuminant cathode with low working function. Therefore, research has been undertaken for locating a metallic material to serve as chips or wires of displays. Silver has been considered to serve as the material of chips or wires; however, there is no stable target or appropriate etchant for silver, so the application is limited.

The resistance of silver alloy containing more than 80 wt% of silver is higher than pure silver, but much lower than chromium metal, so said silver alloy is suitable for producing chips or wires. Again, there is no stable target or appropriate etchant for said silver alloy presently, so a novel silver alloy target used for producing flat panel displays is developed to mitigate and/or obviate the aforementioned problems.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an alloy target used in flat panel display for producing thin film electrodes, conductive wires or auxiliary electrodes with low resistance, high conduction and high adhesion on the panel or substrate.

Another object of the present invention is to provide a process for manufacturing alloy targets to form a thin film electrodes, conductive wires or auxiliary electrodes with low resistance, high conduction and high adhesion on the panel or substrate.

To achieve the objects, the alloy target of the present invention includes silver (Ag), copper (Cu), and at least one precious metal selected from the group consisting of palladium (Pd), gold (Au) and platinum (Pt);

wherein the mole ratio of said silver ranges from 0.8 to 0.999; the mole ratio of said copper ranges from 0.001 to 0.1; the mole ratio of said precious metal ranges from 0.001 to 0.1; and the total mole ratio of said alloy target is 1.

The process for manufacturing alloy targets includes the following steps. First, a composition comprising silver (Ag), copper (Cu), and at least one precious metal is mixed. Said mixture is then processed in a 10^{-1} to 10^{-3} torr vacuum chamber and melted via an electric arc to form a master alloy. The mole ratio of said silver ranges from 0.8 to 0.999; the mole ratio of said copper ranges from 0.001 to 0.1; and, the mole ratio of said precious metal ranges from 0.001 to 0.1.

According to the composition ratio in the alloy and the weight of the ingot, the amount of silver is determined. The master alloy is then mixed with other silver and transferred to a vacuum melting furnace. After being thoroughly melted, the molten metal composition is poured into a mode and then ingot solidifies as it cools. The silver alloy ingot is taken out from the mode and a thermo-mechanical process is carried out according to the required size to form the alloy target.

Other objects, advantages, and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

<u>BRIEF DESCRIPTION OF THE DRAWING</u>

FIG. 1 shows the apparatus for sputtering the alloy target of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The mole ratio of silver used in the alloy target of the present invention ranges from 0.8 to 0.999, and is preferably 0.9 to 0.999. The alloy target of the present invention optionally has added thereto a precious metal such as palladium (Pd), gold (Au) or platinum (Pt). The alloy target may optionally have added thereto at least one corrosion-resistance metal to increase the corrosion resistance of thin film electrodes. The corrosion-resistance metal preferably is titanium, aluminum, nickel, cobalt, chromium or the mixture of two or more of them. The mole ratio of the corrosion-resistance metal preferably ranges from 0.001 to 0.05. The alloy target of the present invention is used for depositing on any kind of substrate, and is preferably used for sputtering the electrodes or conductive wires on the substrate of flat panel displays.

The process for manufacturing the alloy targets used for producing a flat panel display of the present invention is carried out by mixing silver, copper and at least one precious metal to form a composition and melting the composition to form ingots. The composition optionally has added thereto at least one corrosion-resistance metal such as titanium, aluminum, nickel, cobalt, and chromium. The melting method of the present invention may be any common melting method, and preferably is the vacuum melting method or the vacuum refining method.

Embodiment 1 Manufacturing alloy targets for producing thin film electrodes

Silver (2250 g), copper (250 g) and palladium (1000 g) are mixed well and melted by an electric arc to form a master alloy. Silver (46500 g) is further added to said master alloy and then transferred to a vacuum melting furnace to be heated at 1100 to 1300℃ for 3 to 5 hours. After being thoroughly melted, the molten metal composition is poured into a mode and the ingot solidifies as it cools. The silver alloy ingot is then taken out from the mode. The crystalline orientation of the alloy ingot israndom, which is controlled by forging with 600 to 800 ton and by thermal rolling with 80 horsepower or more. The ingot is then thermal-treated and the grain size is controlled at 20~50 μm to obtain the final alloy target.

Embodiment 2 Manufacturing alloy targets for producing thin film electrodes

Silver (1000 g), copper (350 g), palladium (600 g) and chromium (10 g) are mixed well and melted by an electric arc to form a master alloy. Silver (47045 g) is further added to said master alloy and then transferred to a vacuum melting furnace to be heated at 1100 to 1300℃ for 3 to 5 hours. After being thoroughly melted, the molten metal composition is poured into a mode and the ingot solidifies as it cools. The silver alloy ingot is then taken out from the mode. The crystalline orientation of the alloy ingot is random, which is controlled by forging with 600 to 800 ton and by thermal rolling with 80 horsepower or more. The ingot is then thermal-treated and the grain size is controlled at 20~50 μm to obtain the final alloy target.

Embodiment 3

The target prepared from Embodiment 1 is transferred to a sputtering chamber. The sputtering chamber is shown as Fig. 1, including a DC power supply 100, a grounding shield 250, a gas input 700, a vacuum pump 600, and a base 400 for accommodating the panel. When sputtering, target 200 is connected with the cathode of power supply 100, and a panel substrate 300 is also put into the chamber. The flow rate of argon gas is 20 sccm and 200 W of DC electric power is applied to sputter on the substrate 300 for 10 mins under 5 mtorr of vacuum degree. A silver alloy layer with a thickness of 21300 Å then forms on the panel substrate 300. The conduction test shows that the silver alloy layer has excellent conductivity with a sheet resistance of 0.0279 ohm/□. The alloy layer is further undergoes a tape peeling test under high temperature and high humidity (85H/85℃). The results demonstrate that the alloy layer possesses excellent adhesion property.

Embodiment 4

The target obtained from Embodiment 1 is transferred to a sputtering chamber. The flow rate of argon gas is 20 sccm and 200 W of DC electric power is applied to sputter on the substrate 300 for 6.3 mins under 5 mtorr of vacuum degree. A silver alloy layer with a thickness of 4000 Å then forms on the panel substrate 300. The conduction test shows that the silver alloy layer has excellent conductivity with a sheet resistance of 0.076 ohm/□. The alloy layer further undergoes a tape peeling test under high

temperature and high humidity (85H/85℃). The results demonstrate that the alloy layer possesses an excellent adhesion property.

The silver alloy target of the present invention is the first silver alloy target suitable for depsoiting on the substrate of flat panel displays. According to the present invention, silver alloy deposition containing 80% or more silver successfully forms on the panel substrate and can cooperate with silver alloy etchants to form the wire or auxiliary wire patterns on the substrate to consequently produce a substrate having silver alloy wires.

Besides, the target of the present invention is suitable for sputtering on any appropriate kind of substrate, such as an LCD panel substrate or a flat panel substrate.

Although the present invention has been explained in relation to its preferred embodiment, it is to be understood that many other possible modifications and variations can be made without departing from the spirit and scope of the invention as hereinafter claimed.